predetermined touch-off threshold **1422**. If the force is below the touch off threshold, streaming touch output ceases. The computation state may now, for example, return to sample the touch signal **1405** to await the next touch. While the total force continues to exceed the touch-off threshold, the touch location coordinates are calculated **1425**. If a predetermined minimum time has elapsed since touch down **1430**, the newly calculated touch location coordinates are output **1435**. Also, if a distance between the touch down location and the present touch location exceeds a predetermined minimum distance **1440**, the newly calculated touch location coordinates are output **1435**. If the predetermined minimum time has not elapsed **1430** and the touch location has not moved the predetermined minimum distance from the touch down location **1440**, the touchdown coordinates are repeated **1445**. If additional filtering is applied to the coordinate locations just prior to the final output, it may be advantageous to freeze the filter inputs rather than the outputs.

[**0096**] A touch screen system of the present invention may be advantageously implemented in various data processing systems. Turning now to **FIG. 15, a** block diagram of a data processing system **1500** using an integrated touch screen and display is shown in accordance with an embodiment of the present invention. The system **1500** uses a transparent touch screen **1506** arranged above a display **1508** suitable for data processing applications, such as an LCD display. Other displays may be used, such as a CRT display, plasma display, LED display, organic electroluminescent display, or the like. The display **1508** may require display control system circuitry **1509** for interfacing the display with the data processor computer **1510**. A touch screen control system **1507** includes the drive/sense circuitry described above in addition to a touch screen control system processor according to an embodiment of the present invention. The touch screen control system **1507** is coupled to the data processor computer **1510** to provide touch information obtained in accordance with the methods of the invention.

[**0097**] The data processor **1510** may include various components depending upon the computer system application. For example, the data processor may include a microprocessor **1512**, various types of memory circuitry **1514**, a power supply **1518** and one or more input/output interfaces **1516**. The input/output interfaces **1516** allow the data processing system to connect to any number of peripheral I/O devices **1520** such as keyboards **1521**, pointing devices **1522**, and sound devices **1523**, including microphone and speakers. The data processing system may additionally include a mass data storage device **1530**, for example, a hard disk drive or CD ROM drive, and may be networked to other data processing systems through a physical or wireless network connection **1540**.

[**0098**] **FIG. 16** illustrates a touch screen system **1600** in accordance with the present invention, wherein the processes illustrated with reference to FIGS. **1-15** may be tangibly embodied in a computer-readable medium or carrier, e.g. one or more of the fixed and/or removable data storage devices **1610** illustrated in **FIG. 16**, or other data storage or data communications devices.

[**0099**] One or more computer programs **1620** expressing the processes embodied on the removable data storage devices **1610** may be loaded into various memory elements **1630** located within the touch screen control system **1640** to configure the touch screen system **1600** for operation in accordance with the invention. The computer programs **1620** comprise instructions which, when read and executed by the touch screen system processor **1650** of **FIG. 16**, cause the touch screen system **1600** to perform the steps necessary to execute the steps or elements for detecting the location of a touch on a touch screen in accordance with the principles of the present invention.

[**0100**] A touch sensing method and system in accordance with the principles of the present invention provides several advantages. For example, the touch location measurement can be performed at a time when the signal-to-noise ratio of the touch signal is high. The touch sensing approach described herein is well-suited for use with various data processing systems, including personal data assistants (PDAs), electronic instruments, cell phones, and computers, including handheld, laptop and desktop computers.

[**0101**] The present invention should not be considered limited to the particular examples described above, but rather should be understood to cover all aspects of the invention as fairly set out in the attached claims. Various modifications, equivalent processes, as well as numerous structures to which the present invention may be applicable will be readily apparent to those of skill in the art to which the present invention is directed upon review of the present specification. The claims are intended to cover such modifications and processes.

What is claimed is:

1. A method for determining a touch location on a touch screen, comprising:

acquiring a touch signal corresponding to a touch on the touch screen;

using a fixed threshold to determine that the touch signal represents a valid touch input;

detecting the first occurrence of a predetermined shape in the touch signal; and

determining touch location using touch signal information obtained in response to detecting the touch signal shape.

2. The method of claim 1, wherein acquiring the touch signal further comprises acquiring a signal indicative of a touch force.

3. The method of claim 1, wherein detecting the first occurrence of the predetermined shape comprises detecting a preferred time for obtaining touch signal information to determine touch location.

4. The method of claim 3, wherein detecting the preferred time comprises detecting a time when touch signal errors in the touch signal are minimal.

5. The method of claim 3, wherein detecting the preferred time comprises detecting a time when damping effect errors in the touch signal are minimal.

6. The method of claim 3, wherein detecting the preferred time comprises detecting a time when inertial effect errors in the touch signal are minimal.

7. The method of claim 1, wherein detecting the first occurrence of the predetermined shape further comprises detecting a predetermined slope of the touch signal.